UTILITY PATENT APPLICATION TRANSMITTAL
(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.   082225.P4249

First Named Inventor or Application Identifier _Giles et al._

Express Mail Label No. _EL695838575US_

ADDRESS TO:	**Assistant Commissioner for Patents** **Box Patent Application** **Washington, D. C. 20231**

APPLICATION ELEMENTS
See MPEP chapter 600 concerning utility patent application contents.

1. _____ **Fee Transmittal Form**
(Submit an original, and a duplicate for fee processing)

2. _X_ **Specification** (Total Pages ___20___)
(preferred arrangement set forth below)
- Descriptive Title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claims
- Abstract of the Disclosure

3. _X_ **Drawings(s) (35 USC 113)** (Total Sheets _8_)

4. _____ **Oath or Declaration/Power of Attorney** (Total Pages ____)

    a. ___ Newly Executed (Original or Copy)

    b. ___ Copy from a Prior Application (37 CFR 1.63(d))
(for Continuation/Divisional with Box 17 completed) **(Note Box 5 below)**

    i. ___ <u>DELETIONS OF INVENTOR(S)</u> Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

5. _____ **Incorporation By Reference** (useable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. _____ **Microfiche Computer Program** (Appendix)

7. _____ **Nucleotide and/or Amino Acid Sequence Submission**
(if applicable, all necessary)

    a. ___ Computer Readable Copy

    b. ___ Paper Copy (identical to computer copy)

    c. ___ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. _____ Assignment Papers (cover sheet & documents(s))

9. _____ 37 CFR 3.73(b) Statement (where there is an assignee)

10. _____ English Translation Document (if applicable)

11. _____ a. Information Disclosure Statement (IDS)/PTO-1449

  _____ b. Copies of IDS Citations

12. _____ Preliminary Amendment

13. __X__ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)

14. _____ a. Small Entity Statement(s)

  _____ b. Statement filed in prior application, Status still proper and desired

15. _____ Certified Copy of Priority Document(s) (if foreign priority is claimed)

16. __X__ Other: Unsigned Declaration and Power of Attorney (5 pages)

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17. **If a CONTINUING APPLICATION,** check appropriate box and supply the requisite information:

  ___ Continuation ___ Divisional ___ Continuation-in-part (CIP)

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Docket No: 082225.P4249
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Serial/Patent No.: _____   Filing/Issue Date: _____

Client: Sun Microsystems, Inc.

Title: A Server Node with Integrated Networking Capabilities

BSTZ File No.: 082225.P4249   Atty/Secty Initials: MAD/hss

Date Mailed: October 11, 2000   Docket Due Date: _____

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- ☐ Amendment/Response (_____ pgs.)
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- ■ Application - Utility (20 pgs., with cover and abstract)
- ☐ Application - Rule 1.53(b) Continuation (_____ pgs.)
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- ☐ Assignment and Cover Sheet
- ■ Certificate of Mailing
- ■ Declaration & POA (5 pgs.) Unsigned
- ☐ Disclosure Docs & Orig & Copy of Inventors Signed Letter (_____ pgs.)
- ■ Drawings: 8 # of sheets includes 8 figures

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- ☐ Response to Notice of Missing Parts
- ☐ Small Entity Declaration for Indep. Inventor/Small Business
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UNITED STATES PATENT APPLICATION
FOR

A SERVER NODE WITH INTEGRATED NETWORKING CAPABILITIES

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A SERVER NODE WITH INTERATED NETWORKING CAPABILITIES

FIELD OF THE INVENTION

This invention relates to servers in general, and more specifically to a server node

5   with integrated networking capabilities, such as switching, routing, load balancing and

fail-over capabilities.

BACKGROUND OF THE INVENTION

Network applications have placed greater demands on network servers. These

10   demands include greater reliability, increased capacity, and the ability to easily scale to

meet increasing demand. For example, Internet Service Providers (ISPs) require server

networks which are scalable and highly fault tolerant.

One popular method of meeting reliability and scalability requirements is to

construct server farms where several servers are combined to function as a single unit.

15   Figure 1 is a block diagram illustrating a prior art approach to combining multiple

servers. In this example, six servers, S1-S6, are combined into a server farm. All servers

S1-S6 are then connected to a shared switch 100.

Implementing such a server farm requires additional equipment. Figure 2 is a

block diagram illustrating a prior art server farm architecture. In this example, servers S1

20   - S6 are combined and connected to switch 200. The switch 200 is then connected to a

router 202 through a load balancer 201. The router 202 is also connected to a modem

pool 204 and external networks such as the Internet 203.

However, this approach has some drawbacks. First, the various pieces of

equipment such as servers, switches, routers and modems all take up space. Since, in

5   many applications space is at a premium, a small footprint is needed. Secondly, switches

have a limited number of ports. Therefore, scalability is somewhat limited. In order to add

servers beyond the number of ports available on a given switch, additional switches will

be required. This in turn may require the addition of more load balancers and routers.

Additionally, a switch creates a single point of failure. Failure of a switch will make all

10   servers connected to it unavailable. Sometimes redundant switches are used to address

this problem but this approach further complicates scalability. Finally, external

connections between the devices in such an application are slower than internal

connections within a single device.

15

SUMMARY OF THE INVENTION

A server node with integrated networking capabilities is disclosed. According to

one embodiment of the present invention, server nodes consist of one or more processors.

The processors are configured to perform server functions as well as switch and router

functions (e.g., network functions) including load balancing and fail-over. The server

nodes also have a plurality of ports. These ports allow the server nodes to be combined to

form blocks and networks as well as to provide connections to external networks.

According to another aspect of the invention, a method and apparatus for a server

block is disclosed. A server block consists of a plurality of server nodes and a plurality of

signal paths connected with the ports of each server node. At least one path connected

with each node provides an external connection to the server block and at least two paths

connected with each node are connected with other server nodes in the block. When a

server node receives a request, it determines whether it can handle the request. If possible,

the server node handles the request. If the server node cannot handle the request, it routes

the request to a second, neighboring server node.

According to another aspect of the invention, a scalable, fault tolerant server node

network topology may be constructed by interconnecting server blocks in a mesh-like

topology. This computer network consists of a plurality of server blocks and a plurality of

signal paths connected with the server blocks. At least one signal path connected with

each server block provides an external connection to the network and at least two signal

paths connected with each server block are connected with other server blocks in the network.

BRIEF DESCRIPTION OF THE DRAWINGS

5   The appended claims set forth the features of the invention with particularity. The invention, together with its advantages, may be best understood from the following detailed description taken in conjunction with the accompanying drawings of which:

Figure 1 is a block diagram illustrating a prior art approach to combining multiple servers;

10   Figure 2 is a block diagram illustrating a prior art server farm architecture;

Figure 3 is a block diagram conceptually illustrating interconnection of server nodes according to one embodiment of the present invention;

Figure 4 is a flowchart illustrating switching and routing functions of a server node according to one embodiment of the present invention;

15   Figure 5 is a block diagram illustrating physical interconnection of server node cards within a card rack according to one embodiment of the present invention;

Figure 6 is a block diagram conceptually illustrating interconnection of multiple server blocks according to one embodiment of the present invention;

Figure 7 is a block diagram illustrating physical interconnection of multiple server

20   blocks within multiple card racks according to one embodiment of the present invention; and

Figure 8 is a block diagram of a server node board according to one embodiment of the present invention.

DETAILED DESCRIPTION

5   A server node with integrated networking capabilities is disclosed. According to one embodiment of the invention, a server node consists of one or more processors. The processors are configured to perform server functions as well as switch and router functions. The server nodes also have a plurality of ports. These ports allow the server nodes to be connected combined to form blocks and networks as well as to provide

10   connection to external networks. When a server node receives a request, it determines whether it can handle the request. If possible, the server node handles the request. If the server node cannot handle the request, it routes the request to a second, neighboring server node.

According to another embodiment of the invention, a novel grouping and

15   interconnection of server nodes, referred to as a "server block" is disclosed. A server block consists of a plurality of server nodes and a plurality of signal paths connected with the ports of each server node. At least one path connected with each node provides an external connection to the server block and at least two paths connected with each node are connected with other server nodes in the block.

20   According to another embodiment of the invention, a scalable, fault tolerant server node network topology is disclosed. This server node network topology consists of

a plurality of server blocks and a plurality of signal paths connected with the server blocks. At least one signal path connected with each server block provides an external connection to the network and at least two signal paths connected with each server block are connected with other server blocks in the network.

5   In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, to one skilled in the art that the present invention may be practiced without some of these specific details. In other instances, well-known structures and devices are shown in block diagram form.

10   The present invention includes various steps, which will be described below. The steps of the present invention may be performed by hardware components or may be embodied in machine-executable instructions, which may be used to cause a general-purpose or special-purpose processor or logic circuits programmed with the instructions to perform the steps. Alternatively, the steps may be performed by a combination of
15   hardware and software.

As explained above, one method used to increase reliability and scalability has been to combine multiple servers into a server farm. This approach has drawbacks such as requiring large amounts of physical space and reduced reliability due to failures in shared equipment such as routers and switches. The present invention, instead of using separate
20   pieces of equipment, uses a server with an integrated switch. Further, this switch includes some routing and load balancing functions. These server nodes can then be combined to

form a block of servers (a "server block") that performs many of the same functions of the traditional server farms. Further, these server blocks can then be combined to build larger networks of servers that are compact in size and highly fault tolerant.

Figure 3 is a block diagram conceptually illustrating interconnection of server nodes according to one embodiment of the present invention. This block of server nodes 300 consists of six server nodes SN1-SN6. Each server node has four ports. Server node SN1, for example, is interconnected with nodes SN2, SN3 and SN6 and one port is used for an external connection 301. Other nodes are interconnected in a similar fashion. For example, server node SN4 is interconnected with nodes SN3, SN6, and SN5 and one port is used for an external connection 308. While all nodes SN1-SN6 have four ports, not all nodes are connected to three other nodes. For example, server node SN2 is connected to two other server nodes SN1 and SN3 and has two external connections 302 and 303. Likewise, server node SN5 is connected to two other server nodes SN4 and SN6 and has two external connections 306 and 307.

Each node in the block 300 performs normal server function as well as switching, routing, load balancing, and fail-over functions. Routing gives loop free paths and automatic dealing with failed nodes but no load balancing. Load balancing can be handled in various manners but in the preferred embodiment this function is performed as detailed in co-pending U.S. Patent Application No. _____, entitled "Load-Balancing Anycasting and Routing In a Network" filed on _____. To summarize, in this embodiment, load balancing is performed by continuously calculating the load, response

time and link traffic load on all possible connections and picking the one that, at this

point in time, can provide the quickest response. Because this is a distributed calculation,

each node does not need to know how to access all other nodes, it only needs to know

how to access its neighboring nodes. Therefore, routing tables can be very small since a

5   node only needs to know its immediate neighbors and not the entire network.

Figure 4 is a flowchart illustrating switching and routing functions of a server

node according to one embodiment of the present invention. First, at processing block

400, a server node receives a request. This request may be from another, neighboring

server node or an external network such as the internet. The server node then determines

10   whether it can handle this request at decision block 410. This determination may be based

on the present load of the server node, whether requested information is locally available

on the server node, or other considerations. If the server node is able to handle the request

it does so at processing block 420. If unable to handle the request, then at processing

block 430, the server node determines the present load of each available neighboring

15   server node and routes the request to the server node with the lightest load at processing

block 440.

Figure 5 is a block diagram illustrating physical interconnection of server node

cards within a card rack 516 according to one embodiment of the present invention. In

this example, the card rack 516 implements server node block 500 which consists of six

20   server nodes SN1-SN6. Each server node is constructed on a card represented as 509-515

that could be stored in the card rack 516. Additionally, each block includes an interface

card 515. This interface card 515 provides all external connections and provides all

necessary buffering. Connections between all server node cards 509-514 and between

server node cards and the interface card 515 can then be made through a series of jumpers

on the back of each card in the card rack 516. For example, server node card SN1 is

5   connected to server node cards SN2, SN3, and SN6 through jumpers 525-527 and to the

interface card 515 through jumper 528. The other cards in the rack are connected in

similar fashion to construct the server block 500.

Several server blocks 500 can be interconnected to form a larger network of

servers. Figure 6 is a block diagram conceptually illustrating interconnection of multiple

10   server blocks according to one embodiment of the present invention. Here, four server

blocks 610-640 are interconnected to form a server network. In such a network, at least

two nodes of a block are connected to at least two nodes of another block. In the example

illustrated in Figure 6, block 610 is connected with block 620 and block 630. Server node

SN2 of block 610 is connected to server node SN4 of block 620 and server node SN3 of

15   block 610 is connected to server node SN5 of block 620. Likewise, server node SN5 of

block 610 is connected to server node SN1 of block 630 and server node SN6 of block

610 is connected to server node SN2 of block 630. Further, in this example, block 620

and block 630 are connected in a similar manner to block 640.

Each server block 610-640 has a total of eight external connections A-H. Those

20   connections not used for interconnecting to another server block are available for

connection to an external network. For example, block 610 has four connections available

for connection to an external network A, B, G, and H. Each of the other blocks 620-630

likewise have four connections available for connection to an external network. Block

620 has connections A-D, block 630 has connections E-H and block 640 has connections

C-F all available for connection to an external network.

5   As explained above, each server node is connected to at least two other server

nodes in the network. Further, each server node has integral switching and routing

capabilities. Interconnections of server blocks as illustrated in Figure 6 makes efficient

use of the switching and routing capabilities of the individual server nodes and creates a

highly fault tolerant server network. For example, if server node SN5 of block 620 were

10   to fail, the network could still operate normally. Once server node SN5 of block 620

failed, the neighboring nodes such as server nodes SN4 and SN6 of block 620, SN3 of

block 610, and SN1 of block 640 would detect the failure and remove the failed nodes

from their routing tables. Transactions passing through the neighboring nodes could then

be routed around the failed node and thereby allow the network to function with a

15   minimum of disruption.

A network constructed of servers nodes having four ports in the manner illustrated

with reference to figure 6 will have some practical size limitations. Using server nodes

with four ports limits the network size to approximately 200 nodes. In alternative

embodiments of the present invention, each server node may have more than four ports.

20   For example, each server node may have six ports. With six ports, the basic server block

structure illustrated with reference to figure 3 may be maintained with the addition of two

more ports available for connection to other blocks. These additional ports can be used to extended the network described with reference to figure 6 into a three dimensional topology. By using server nodes with six ports and a three dimensional topology, highly fault tolerant networks can be constructed which use up to 512 server nodes.

5   As explained above, each server node can be constructed on a single printed circuit board that can then be mounted in a card rack and configured to form a server block. These rack mounted server blocks can then be interconnected to form a server network. Figure 7 is a block diagram illustrating physical interconnection of multiple server blocks within multiple card racks according to one embodiment of the present

10   invention. In this example, four blocks block 710 - block 740 are illustrated. Each block constructed in a card rack consists of server node cards 700 and an interface card 701. The interface cards 701 provide connections to external networks or devices as well as allow interconnection to other blocks 703 to form a server network. In this manner, a highly fault tolerant and easily scalable network can be built.

15   Figure 8 is a block diagram of a server node board according to one embodiment of the present invention. Each server node 800 contains a main processor 810 and a network interface processor 825. The main processor 810 with its dedicated memory 815 is connected through bus A 840 to a mass storage interface 805. This interface 805 provides a connection 850 to external storage devices (not shown) such as disk arrays.

20   The main processor 810 is connected through bus B 845 to the network interface processor 825, shared memory 830, and system flash memory 835. The system flash

memory 835 provides system operation instructions to both the main processor 810 and

the network interface processor 825. The network interface processor 825 with its

dedicated memory 820 provides the server node ports 855 and performs network

functions including switching, routing, load balancing and fail-over processing. The

5   shared memory 830 is used by both the main processor 810 and the network interface

processor 825. This memory 830 is used to store message packets sent and received

through the network interface processor 825.

CLAIMS

What is claimed is:

1

2   1.   An apparatus comprising:

3   one or more processors, the one or more processors configured to perform server

4   functions and switch and router functions including load balancing and

5   fail-over; and

6   a plurality of ports coupled with the one or more processors

1   2.   The apparatus of claim 1, wherein said server node comprises a single printed

2   circuit board

1   3.   The apparatus of claim 1, where the plurality of ports comprises four ports.

1   4.   The apparatus of claim 2, wherein the printed circuit board is rack mountable and

2   the plurality of ports are accessible as connection points on the card rack.

1   5.   A server block comprising:

2   a plurality of server nodes, each server node comprising a server with integrated

3   switching, routing, load balancing and fail-over functions and a plurality

4   of ports, at least one port of the plurality of ports configured for

5   connection to an external network; and

6   a plurality of signal paths connected with the plurality of ports of the server nodes

7   of the plurality of server nodes, at least two of the plurality of ports of each

8   server node of the plurality of server nodes connected with another server

9   node of the plurality of server nodes in the server block.

1   6.   The apparatus if claim 5, wherein each said server node of the plurality of server

2   nodes comprises one printed circuit board.

1   7.   The apparatus of claim 6, wherein the printed circuit board is rack mountable and

2   the plurality of ports of each server node of the plurality of server nodes are

3   accessible as connection points on the card rack and the server block is

4   constructed in one card rack by interconnecting the connection points on the card

5   rack.

1   8.   The apparatus of claim 7, wherein the external connections of the server block are

2   provided through an interface card in the card rack, the interface card being

3   connected to the plurality of server nodes through connection points on the card

4   rack.

1   9.   A computer network comprising:

2   a plurality of server blocks wherein each server block comprises;

3   a plurality of server nodes, each server node comprising a server with

4   integrated switching, routing, load balancing and fail-over

5   functions and a plurality of ports, and

6   a plurality of signal paths connected with the plurality of ports of each

7   server node of the plurality of server nodes, at least one signal path

8   connected with each server node of the plurality of server nodes

9   providing an external connection to a server block, and at least two

10   signal paths of the plurality of signal paths connected with each

11   server node of the plurality of server nodes being connected with

12   other server nodes of the plurality of server nodes in the block; and

13   a plurality of signal paths connected with the server blocks, at least one signal

14   path connected with each server block of the plurality of server blocks

15   providing an external connection to the network, and at least two signal

16   paths of the plurality of signal paths connected with each server block of

17   the plurality of server blocks being connected with other server blocks of

18   the plurality of server blocks.

1   10.   The apparatus of claim 9, wherein each server node of the plurality of server

2   nodes comprises one printed circuit board.

1   11.   The apparatus of claim 10, wherein the printed circuit board is rack mountable

2   and the plurality of ports of each server node of the plurality of server nodes are

3   accessible as connection points on the card rack and a server block is constructed

4   in one card rack by interconnecting the connection points on the card rack.

1   12.   The apparatus of claim 11, wherein the external connections of the plurality of

2   server blocks are provided through an interface card in the card rack, the interface

3   card being connected to the plurality server nodes through connection points on

4   the card rack.

1   13.   A method of operating a first server node comprising:

2   receiving a request;

3   determining whether to service the request;

4   if unable to service the request, routing the request to a second server node

5   coupled with the first server node.

1   14.   The method of claim 13, wherein determining whether the first server node can

2   service the request is based on the present load of the first server node.

1   15.   The method of claim 13, wherein routing further includes load balancing.

1   16.   The method of claim 15, wherein load balancing comprises:

2   determining the present load of one or more other server nodes coupled with the

3   first server node; and

4   routing the message to the server node of the one or more server nodes with the

5   lightest load.

1   17.   A machine-readable medium having stored thereon data representing sequences of

2   instructions, the sequences of instructions which, when executed by a processor,

3   cause a first server node to:

4   receive a request;

5   determine whether to service the request;

6   if unable to service the request, route the request to a second server node coupled

7   with the first server node.

1   18.   The machine-readable medium of claim 17, wherein determining whether the first

2   server node can service the request is based on the present load of the first server

3   node.

1   19.   The machine-readable medium of claim 17, wherein routing further includes load

2   balancing.

1   20.   The machine-readable medium of claim 19, wherein load balancing further

2   comprises:

3   determining the present load of one or more other server nodes coupled with the

4   first server node; and

5   routing the message to the server node of the one or more server nodes with the lightest

6   load.

ABSTRACT

According to one aspect of the invention, a method and apparatus for a server node is disclosed. This server node consists of one or more processors. The processors are configured to perform server functions as well as switch and router functions including

5   load balancing and fail-over. The server nodes also have a plurality of ports. These ports allow the server nodes to be connected combined to form blocks and networks as well as to provide connection to external networks. When a server node receives a request, it determines whether it can handle the request. If possible, the server node handles the request. If the server node cannot handle the request, it routes the request to a second,

10   neighboring server node.

According to another aspect of the invention, a method and apparatus for a server block is disclosed. This server block consists of a plurality of server nodes and a plurality of signal paths connected with the ports of each server node. At least one path connected with each node provides an external connection to the server block and at least two paths

15   connected with each node are connected with other server nodes in the block.

According to another aspect of the invention, a method and apparatus for a computer network is disclosed. This computer network consists of a plurality of server blocks and a plurality of signal paths connected with the server blocks. At least one signal path connected with each server block provides an external connection to the network and

20   at least two signal paths connected with each server block are connected with other server blocks in the network.
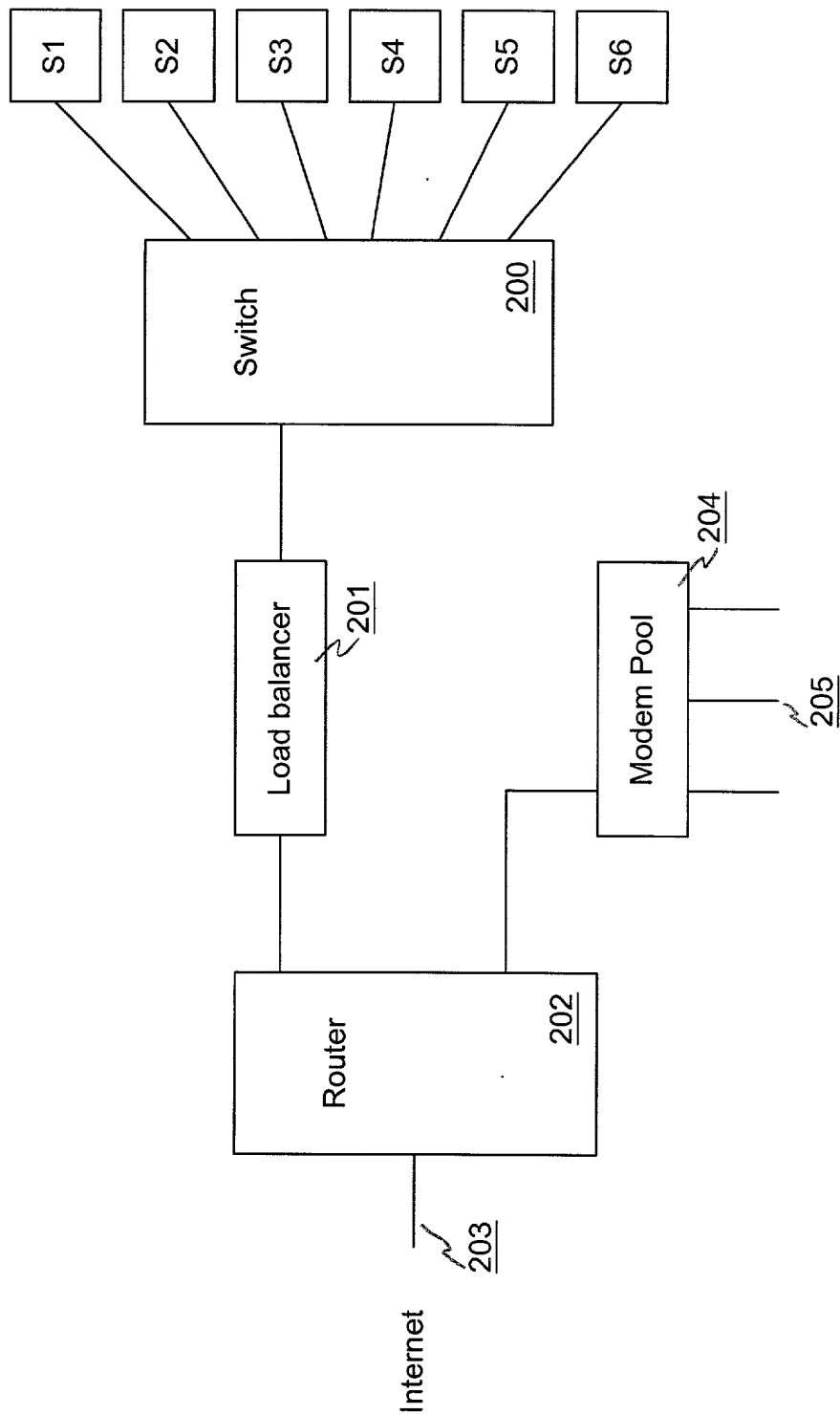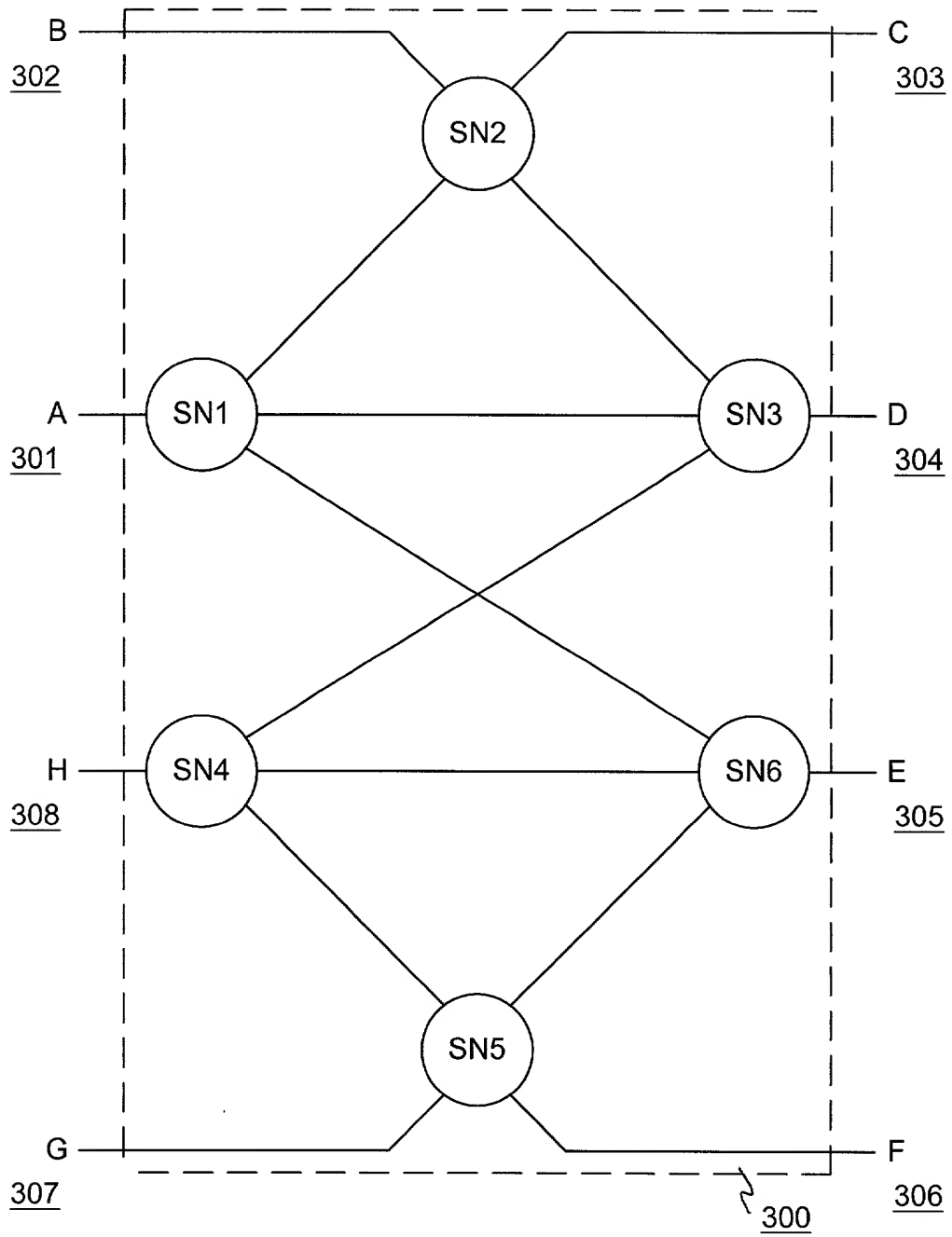
Figure 1
(Prior Art)

| S1 | S2 | S3 | S4 | S5 | S6 |

Switch

<u>200</u>

Load balancer

<u>201</u>

Modem Pool

<u>204</u>

<u>205</u>

Router

<u>202</u>

<u>203</u>
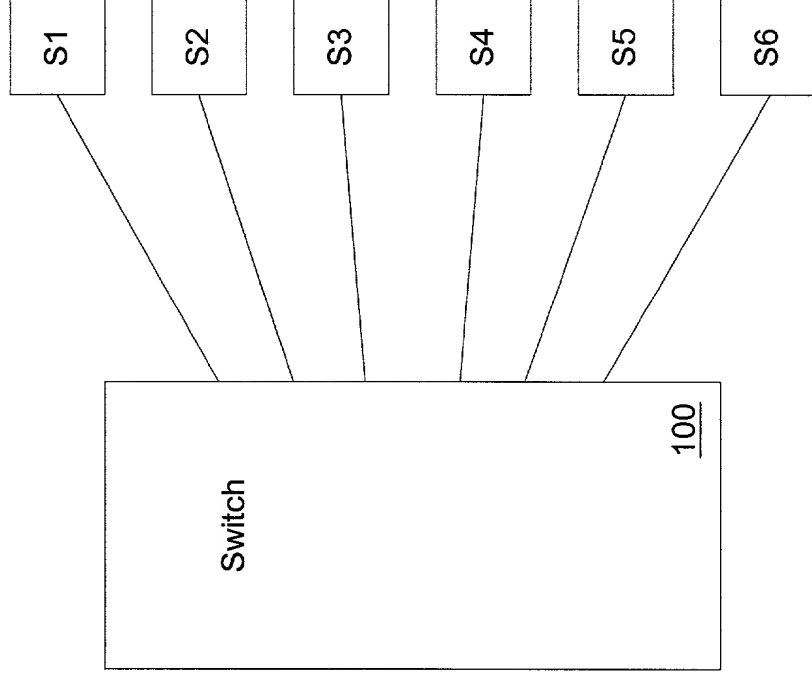
Internet

Figure 2
(Prior Art)

Figure 3

Switching and Routing
Process

400
Receive request

410
Can request be
handled by this
server node?

N

Y

420
Handle request

430
Determine the present
load of each available
neighboring server node

440
Route the request to the
server node with the
lightest load

End
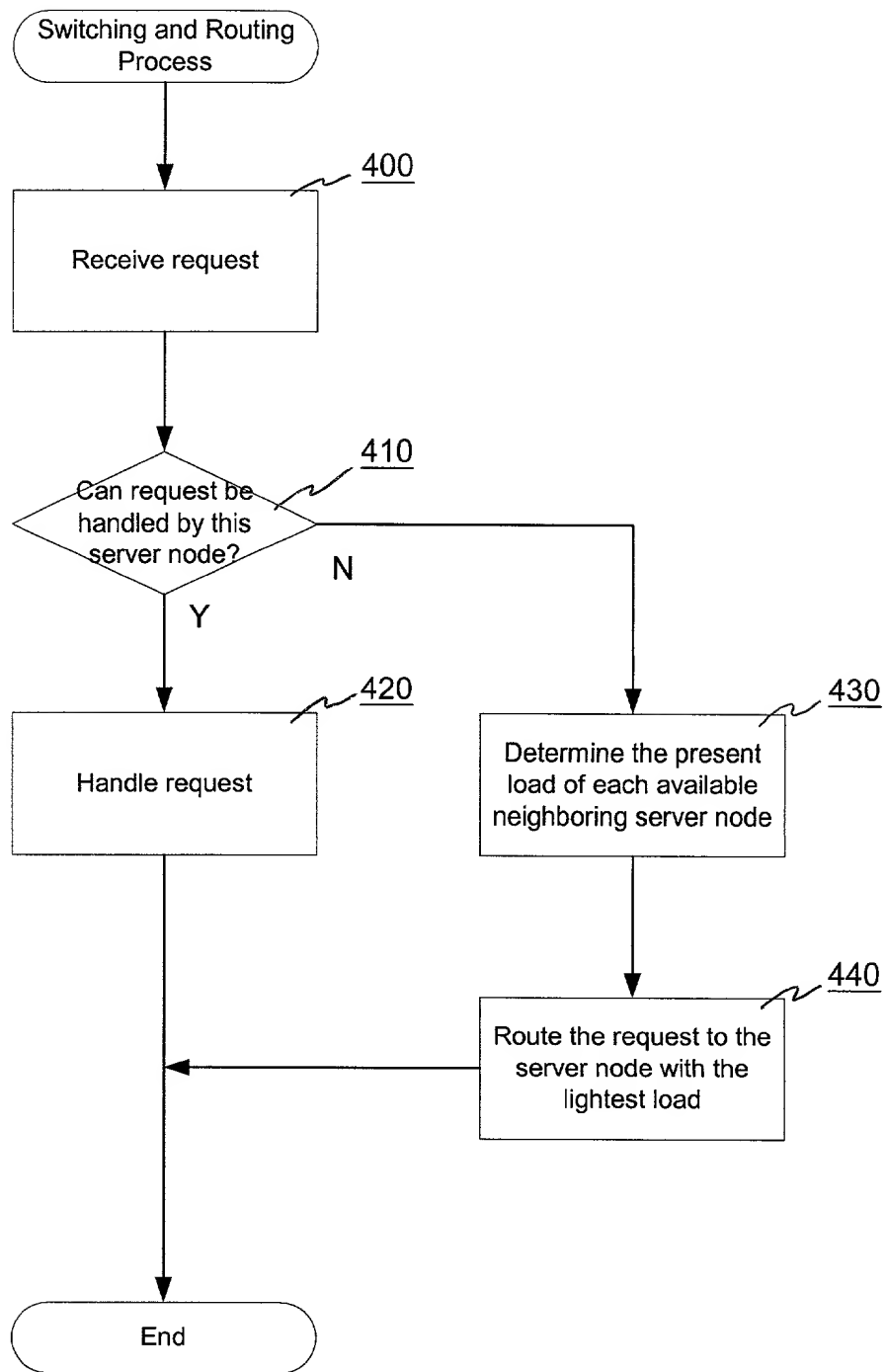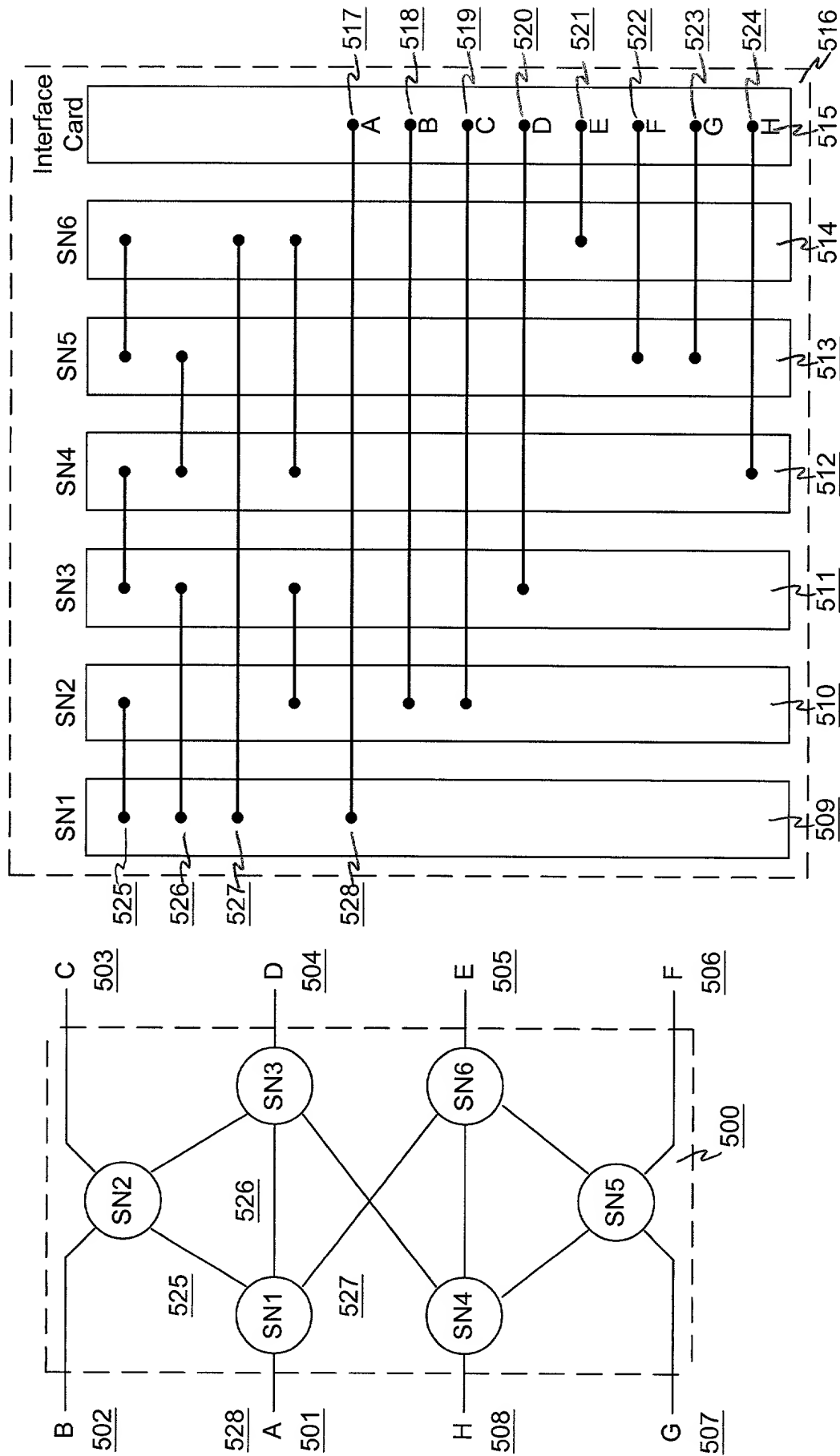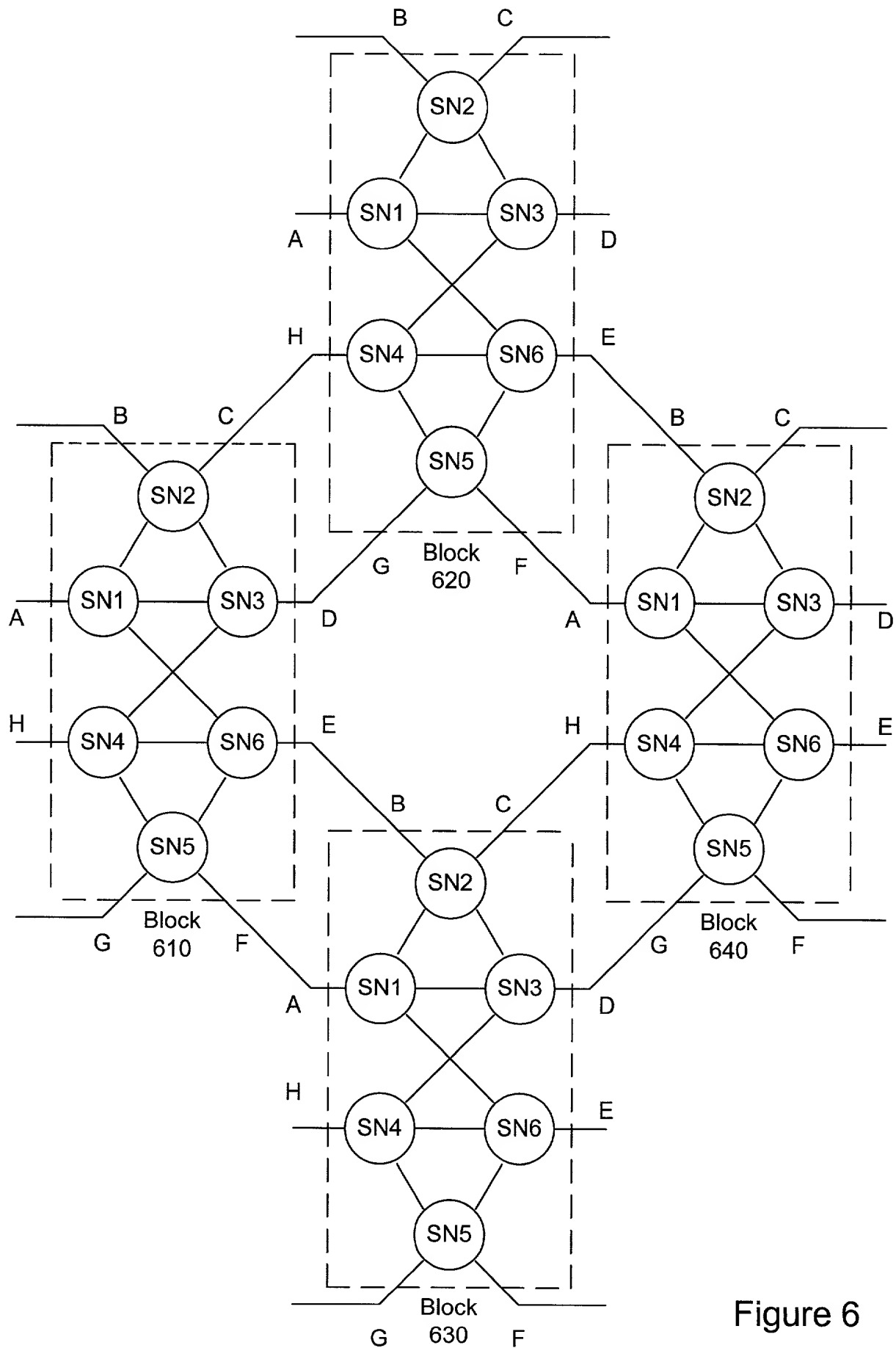
Figure 4

Figure 5

Figure 6
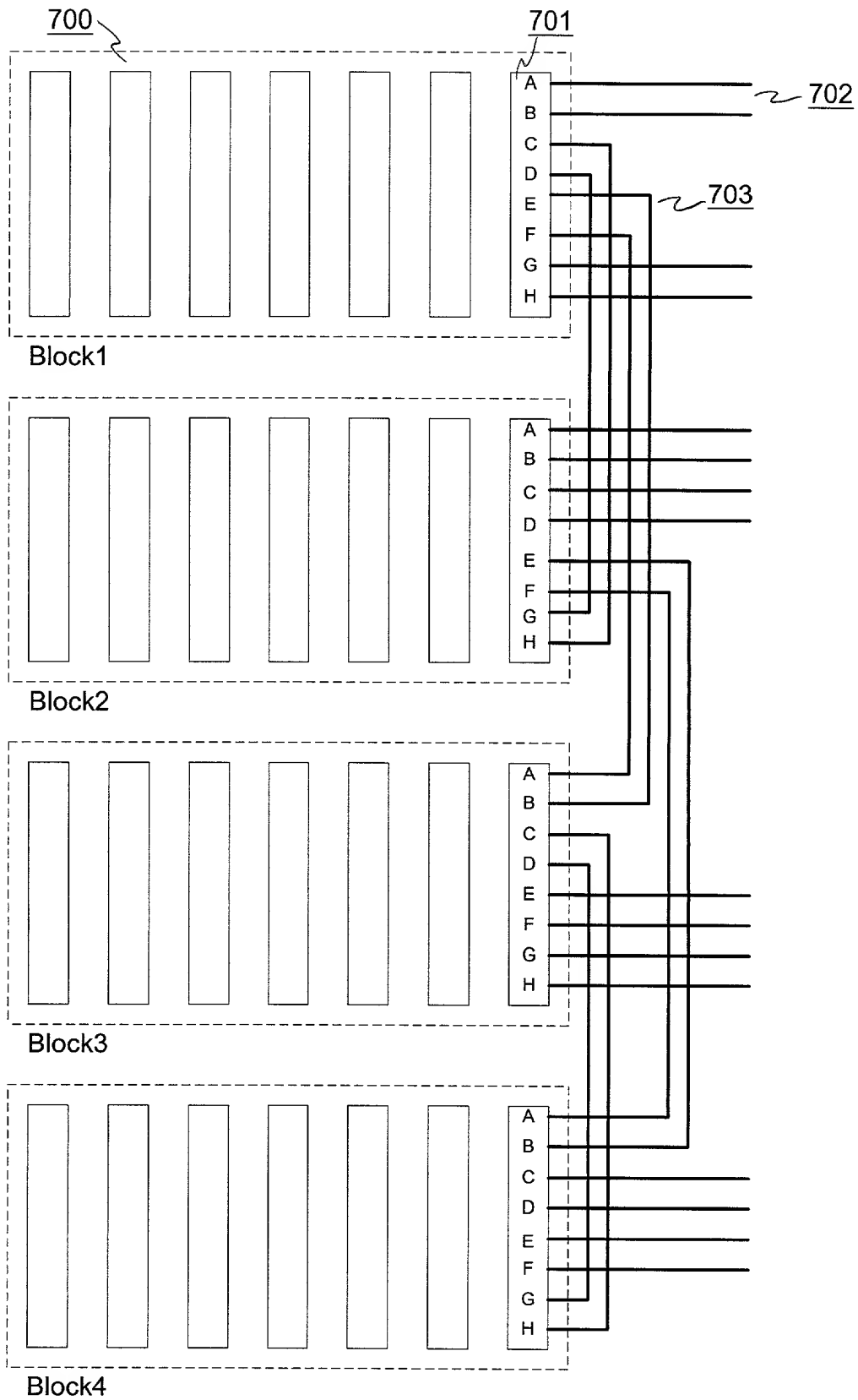
Figure 7
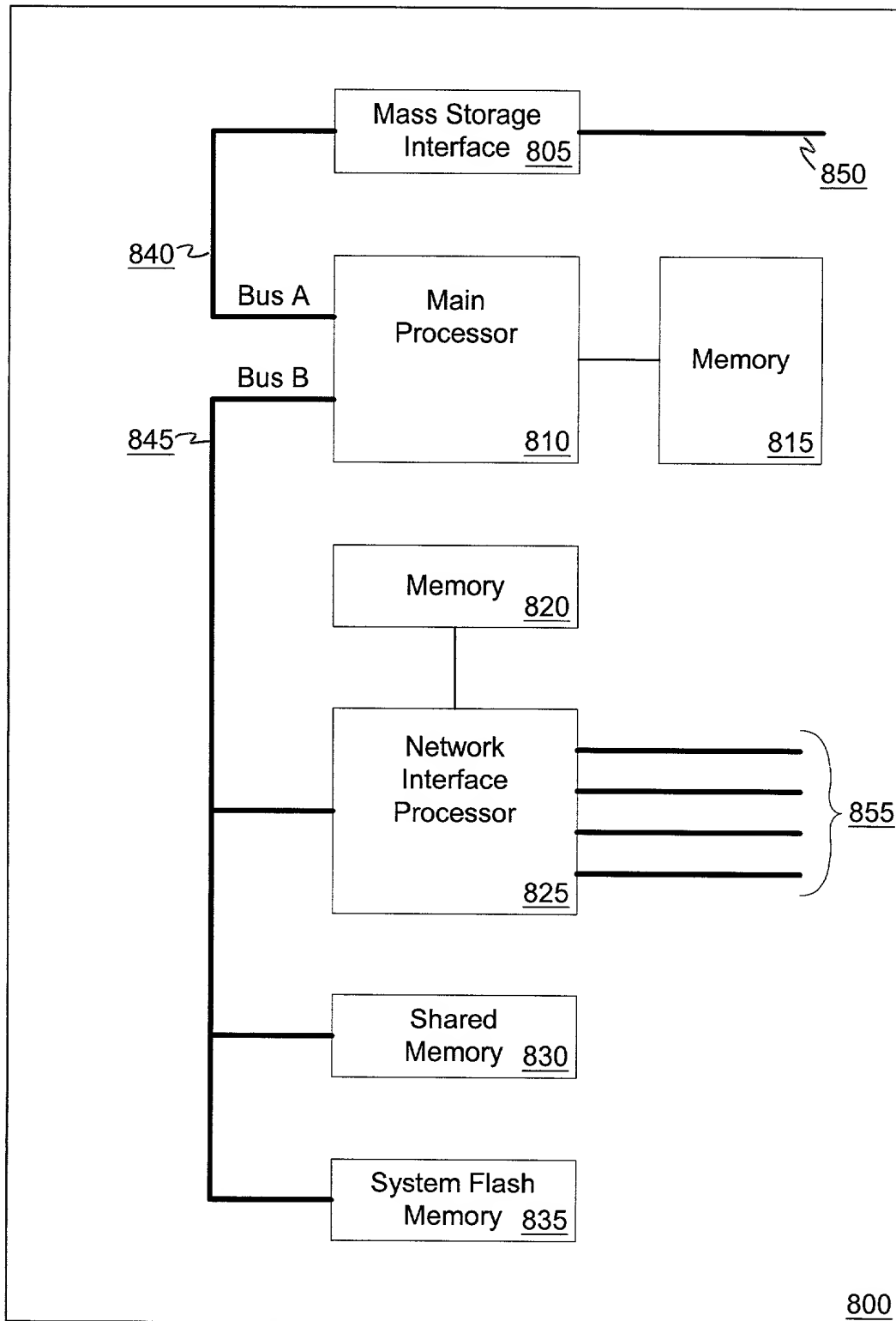
Figure 8

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

A SERVER NODE WITH INTEGRATED NETWORKING CAPABILITIES

the specification of which

  __X__   is attached hereto.

  ___   was filed on _____ as

     United States Application Number _____

     or PCT International Application Number _____

     and was amended on _____ .

          (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

EXPRESS MAIL CERTIFICATE OF MAILING

"Express Mail" mailing label number: EL695838575US

I hereby certify that I am causing this paper or fee to be deposited with the United States Postal Service "Express Mail Post Office to Addressee" service on the date indicated above and that this paper or fee has been addressed to the Assistant Commissioner for Patents, Washington, DC 20231.

October 11, 2000
_____
Date of Deposit

Heather S. Smith
_____
Name of Person Mailing Correspondence

_____   10/11/00
Signature   Date

<u>Prior Foreign Application(s)</u>

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

(Application Number)	Filing Date
(Application Number)	Filing Date

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Number)	Filing Date	(Status -- patented, pending, abandoned)
(Application Number)	Filing Date	(Status -- patented, pending, abandoned)

I hereby appoint the persons listed on Appendix A hereto (which is incorporated by reference and a part of this document) as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

Send correspondence to __Michael A. DeSanctis,__ BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP, 12400 Wilshire Boulevard 7th Floor, Los Angeles, California 90025 and direct telephone calls to (303) 740-1980.

Docket No. 082225.P4249
Express Mail No. EL 695838575US

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's Signature _____ Date _____

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Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
　　　　　　　　　(City, State)　　　　　　　　　　　　　　　　(Country)

Post Office Address _____

Docket No. 082225.P4249
Express Mail No. EL 695838575US

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APPENDIX B

Title 37, Code of Federal Regulations, Section 1.56
Duty to Disclose Information Material to Patentability

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclosure information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclosure all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1)   Prior art cited in search reports of a foreign patent office in a counterpart application, and

(2)   The closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b)   Under this section, information is material to patentability when it is not cumulative to information already of record or being made or record in the application, and

(1)   It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2)   It refutes, or is inconsistent with, a position the applicant takes in:

(i)   Opposing an argument of unpatentability relied on by the Office, or

(ii)   Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c)   Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1)   Each inventor named in the application;

(2)   Each attorney or agent who prepares or prosecutes the application; and

(3)   Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d)   Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.